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First continental record of *Tantilla vermiformis* Hallowell, 1861 (Squamata, Colubridae) for Honduras

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Abstract

Here we present the first continental record of *Tantilla vermiformis* Hallowell, 1861 for Honduras. This species is confined almost exclusively to dry and arid lowland forest and is considered as a priority one species in the conservation priority list of endemic species of Central America. This record is the second for the country, after that from Isla Exposición, and represents a northeastern extension of 120 km. The next nearest record to the north-northwest is 250 km distant at Lago Ilopango, in El Salvador, and that to the southeast is 130 km away in the municipality of Chinandega, in Nicaragua.

Keywords

Arid forest, Centipede Snake, distribution, morphology, reptile, southeastern Honduras.

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Introduction

The genus *Tantilla* Baird & Girard, 1853 currently comprises 66 described species (Hofmann et al. 2017; McCranie and Smith 2017; Uetz et al. 2020). The members of this genus inhabit the southern Nearctic and northern Neotropical regions of the Western Hemisphere, having "a coast-to-coast distribution, from the mid- and southern regions of the United States, throughout most of Mexico and Central America, and in South America as far as southern Peru, Bolivia, Uruguay, and northern Argentina" (Wilson 1982b; Wilson and Mata-Silva 2014). The members of this genus have a broad elevational range, from sea level up to 3,080 m a.s.l. (Wilson 1982a, 1999; Wilson and Mata-Silva 2015).

Tantilla snakes are cryptozoic, semi-fossorial, and of small size (Taylor 1936; Sánchez-Guillén and Mendoza-Mendoza 2014). Due to these features, the biology of many species is poorly known. The taxonomy of the group is confusing, with many synonymies and species separation, which reflects a lack of understanding of the phylogenetic relationships (Taylor 1936; Van Devender

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and Cole 1977; Wilson 1982a; Greenbaum et al. 2004; Townsend et al. 2013). Presently, many species have few individuals deposited in scientific collections, and there have been few published studies on their internal morphology (e.g., osteology and hemipenial structure) or their phylogeny (Taylor 1936; Van Devender and Cole 1977; Wilson 1982a; Townsend et al. 2013).

Tantilla vermiformis Hallowell, 1861 belongs to the *T. calamarina* group (Wilson 1999) and is distributed from the Atlantic watershed in the Motagua Valley, southeastern Guatemala, and the Pacific watershed, in west-central El Salvador, through southern Honduras; and from western Nicaragua to northwestern Costa Rica, from 20 to 590 m a.s.l. (Van Devender and Cole 1977; Wilson 1982a; Köhler 2001; Köhler et al. 2006; McCranie et al. 2013; Ariano-Sánchez 2015; GBIF 2020). McCranie (2011) mentioned a possible occurrence of *T. vermiformis* in Honduras, which was confirmed later by McCranie et al. (2013) based on a record from Isla Exposición, in the Golfo de Fonseca.

In this document, we present the first record of *T. vermiformis* from continental Honduras, specifically from the department of El Paraíso. This is the second record of this species for the country and serves to substantiate a connection of the continental range between El Salvador and Nicaragua.

Methods

Our new record occurred during a field trip to the community of El Rodeo in March 2016, one of the driest regions of Honduras, represented by a type vegetation of a Lowland Arid Forest (Holdridge 1967; Mejía-Ordoñez and House 2002). This region captures between 800 to 1000 mm of rainfall per year (Anonymous 2006) and is characterized by an extended severe dry season from December to May with an average annual temperature of about 22 °C (Zúniga-Andrade 1990) and a frequent range of 32–34 °C during the day (McCranie et al. 2014).

We found the specimen of *T. vermiformis* in a riparian forest between a 3–4 m bush area and the banks of the La Aurora river, tributary of Choluteca river, during a casual walk on the first night. We fixed it with formalin at 10%, and then submerged it in a 50% alcohol solution following the techniques of Pisani (1973). The permit to collect the specimen was provided by the Fundación Yuscarán (INVFY-003/2020). We deposited the specimen in the herpetological collection of the Museum of Natural History Biodiversidad y Ciencia at the Universidad Nacional Autónoma de Honduras, in Valle de Sula, San Pedro Sula, Honduras (UVS-V).

Body measurements were taken with a Vernier caliper (Mitutoyo) to the nearest 0.02 mm, following Savage (1973). We abbreviated the characteristics as follows: total length (TOL), snout-vent length (SVL), tail length (TAL), tail length/total length ratio (TAL/TOL), head length (HL), head width (HW), and eye width (EW). We followed Savage (1973) for head scale counting, and Dowling (1951) for the following scales: ventrals (V), subcaudals (SC), temporals (TE), supralabials (SL), and infralabials (IL).

We identified the specimen with the keys from Wilson (1999) and McCranie (2011), confirming it with information from Wilson and Mata-Silva (2015). We based the description on McCranie and Gutsche (2016), and described the color in life following Campbell (1998), using digital photographs taken with a Nikon Camera D3000. We based names and color codes on Köhler (2012). We determined sex by following the method of Nickerson (1970), which consists of checking for the presence of hemipenis by trying to pop it out of the body of the snake.

Results

***Tantilla vermiformis* Hallowell, 1861**

Figures 1, 2; Appendix Table A1

New record. HONDURAS • 1 adult ♀; department of El Paraíso, municipality of Yuscarán, Reserva Biológica Yuscarán, La Aurora river, 1.1 km northeast of the community of El Rodeo; 13.8983°N, 086.7727°W; approximately 450 m a.s.l.; 4 Mar. 2016; Cristopher Alberto Antúnez-Fonseca, Omar Eduardo Jimenez-Córdova, and Josue Ramos-Galdamez leg.; UVS-V 1241.

The specimen was found active at 21:34 h on sandy substrate about 5 meters distant from the water on the riverside moving down dry cattle manure at an ambient temperature of 24 °C (Fig. 2B).

Identification. The *T. vermiformis* specimen (Fig. 2A) presents the following body measurements (in mm): TOL= 156.0, SVL= 132.0, TAL= 24.0, TAL/TOL= 0.15, HL= 6.0, HW= 3.35, EW= 1.5. Head slightly distinct from the body; pupil circular; loreal absent; preocular in contact with postnasal; supralabials 7/7, with 3rd and 4th in contact with the eye; rostral one; parietals two; infralabials 6/6, first pair medially separated by mental and others by mental shield and anterior and posterior chinshields; elongated chinshields arranged in two pairs; mental groove present; postoculars 2/2; internasal 1/1; prenasal 1/1; postnasal 1/1; supraocular 1/1; temporals 1+1; frontal one; ventrals 117; divided subcaudals 26; cloacal shield divided; smooth dorsal scales, without apical pits and arranged in 15–15–15 rows. Dentition opisthoglyph. Color in life as follows: dorsal surface of the body Cinnamon-Rufous (Color 31), with scale edges Yellow Ocher (14); dark points on the vertebral scales end at the cloaca and on the tail become a continuous irregular line; dorsolaterals throughout the body uniform Warm Sepia (40); the anterosuperior (snout) region of the head is Yellow Ocher (14), as is the nuchal collar; eye Warm Sepia (40), chin and belly immaculate Cream White (52).

The members of *T. vermiformis* are distinguished from other members of the same genus for having a brown or pink back, with a dark middorsal line in the middorsal scale row, a pale parietal spot in the head, two

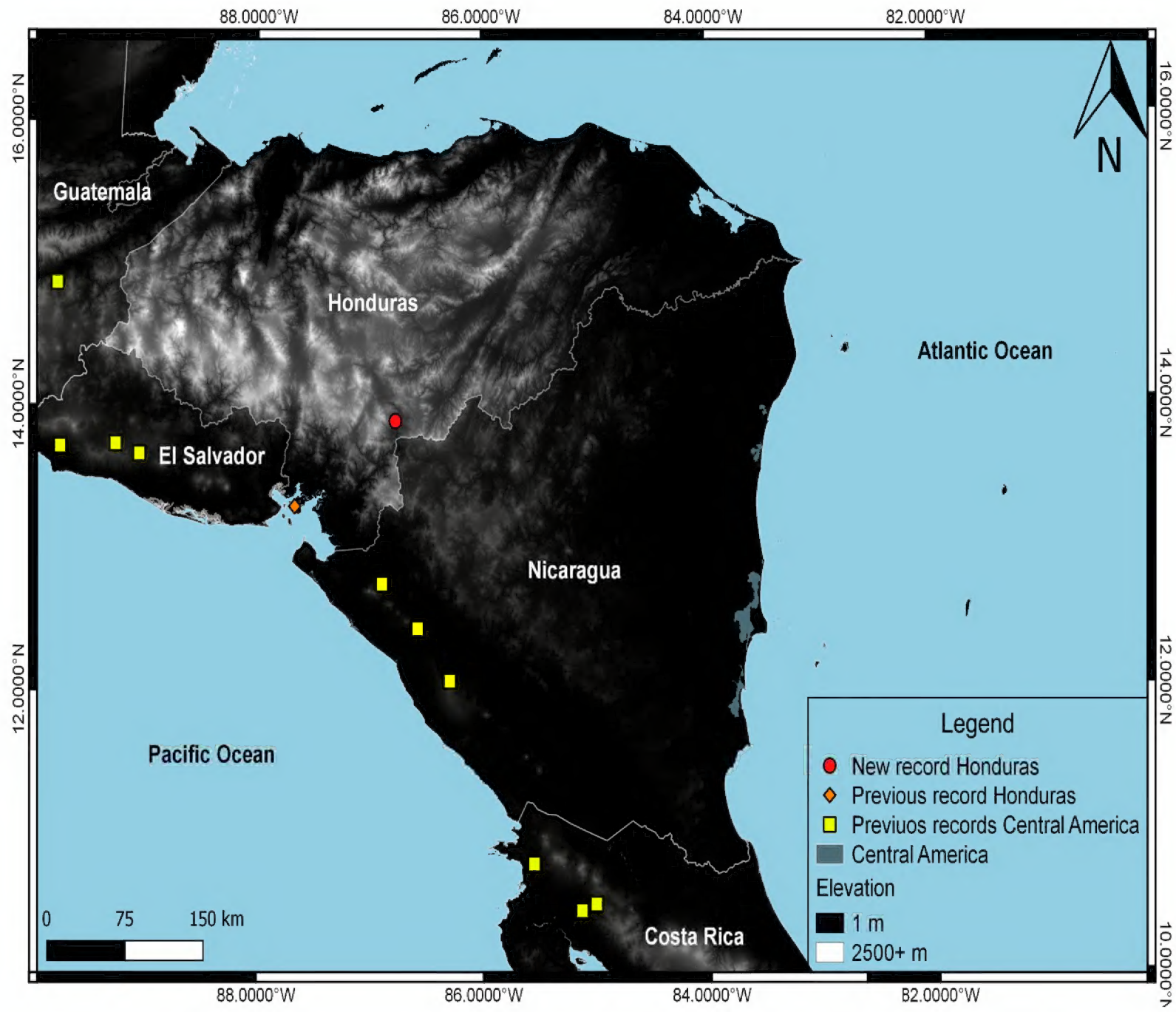

Figure 1. Map of geographic distribution of *Tantilla vermiformis*. The red circle represents the new record for the species, the orange rhombus corresponds to the records from insular Honduras, and the yellow squares represent the known records in Guatemala, El Salvador, Nicaragua, and Costa Rica.

Figure 2. A. Specimen of *Tantilla vermiformis* (UVS-V 1241). **B.** La Aurora river, where the *Tantilla vermiformis* (UVS-V 1241) was collected.

postoculars, seven supralabials, maximum know TOL 167, 115–129 ventrals, and 19–27 subcaudals (Wilson 1982a, 1987). A member of the genus that can live in the same geographical area is *T. armillata* but presents a greater length, with a maximum know TOL 490, 155–177 ventrals, and 42–65 subcaudals (McCranie 2011; McCranie and Gutsche 2016).

The measurements and scalation of the examined specimen are consistent with the known range variation of *T. vermiformis* (Wilson and Villa 1973; Wilson 1982a; Van Devender and Cole 1977; Savage 2002; Köhler et al. 2006; McCranie and Gutsche 2016; Table 1). The coloration, in turn, is at variance with that described for specimens from other countries. Our specimen has the fragmented dark mediodorsal line inconspicuous; the dorsal surface of the body is pale; and the venter presents an immaculate cream white color. The Nicaragua specimens have pale pink venter (Wilson and Villa 1973; Wilson 1982a); the Costa Rica specimens have the dark middorsal stripe almost continuous, and some individuals with a pale yellow venter (Van Devender and Cole 1977); the El Salvador specimens have a dark brown dorsal surface (Köhler et al. 2006); and the southern Honduras specimens have the dark middorsal stripe continuous, the dorsal surface of the body is dark, and the venter is glaucous (McCranie and Gutsche 2016).

Discussion

Our new record of *T. vermiformis* represents the first continental and the second overall record for Honduras. The first record for the country is from Isla Exposición, in the Golfo de Fonseca, in the insular part of the department of Valle, located in the southern portion of the country (McCranie et al. 2013). In addition, McCranie et al. (2013) mentioned that the individual was active during the day, in contrast to the specimen reported here, which was active at night. The occurrence of this species in El Rodeo, Yuscarán, fills a gap in the known distribution between the populations of central El Salvador and those of western Nicaragua. The locality of the specimen reported here lies 120 km northeast from that reported by McCranie et al. (2013). Furthermore, it is separated by 250 km east-southeast from the nearest record in Lago Ilopango, El Salvador, and 130 km northwest from that in the municipality of Chinandega, Nicaragua. The elevational data for this specimen increases the species range of occurrence in Honduras from 20 m to 450 m a.s.l. (McCranie et al. 2013).

Tantilla vermiformis is considered part of the subhumid assemblage species group and is considered endemic to Middle American Subhumid Forest (Wilson and McCranie 1998). The present record is from an area known as the middle and upper Choluteca Valley. Previously, this snake was recorded in subhumid areas of the Pacific Coast of Nicaragua and Costa Rica (Wilson and McCranie 1998); all of these localities can be considered as a block termed the Pacific slope subhumid areas. The individual found in Guatemala is from the Motagua Valley subhumid area, so this species might occur farther north on Atlantic slope of Middle America. In Wilson and McCranie's (1998) discussion, *T. vermiformis* was not included in the analysis of generalized tracks and areas of endemism. Now, given the existence of the recent localities in Guatemala (Ariano-Sánchez 2015), and considering the distribution of *T. calamarina* species group members, it is possible that the western Mexican is the generalized track (Wilson and McCranie 1998) most likely to account for the current distribution of *T. vermiformis*. If so, this would mean that ancestors reached the subhumid forests of Middle America by dispersing southward from the subhumid lowlands of western Mexico.

The presence of *T. vermiformis* in the lowland arid forest of El Rodeo increases the importance of protection of this forest patch, and indicates the need for more attention to riparian forest because this type of habitat potentially can serve as a refuge for different taxa present in tropical forest (Meave et al. 1991). Also, the riparian forest should be protected by the local people, inasmuch as they benefit from the maintenance of the river's water.

Mata-Silva et al. (2019) mentioned that *T. vermiformis* occurs only in the physiographic region of the Pacific lowlands, from southeastern Guatemala to northwestern Costa Rica (although the town in Guatemala occurs on the Atlantic lowlands). The Environmental Vulnerability Score placed this species at the lower limit of the high

Table 1. Data on the examined specimens from the countries in which *Tantilla vermiformis* is distributed. Acronyms: CR: Costa Rica; NIC: Nicaragua; HN: Honduras; ES: El Salvador; GUA: Guatemala; V: ventrals; SC: subcaudals; TE: temporals; SL: supralabials; IL: infralabials; TOL: total length (mm); SVL: snout-vent length (mm); TAL/TOL: tail length/total length ratio. Sources: Costa Rica: Van Devender and Cole (1977), Wilson (1982a), Savage (2002); Nicaragua: Wilson and Villa (1973), Van Devender and Cole (1977), Wilson (1982a); Honduras: McCranie and Gutsche (2016), this study; El Salvador: Köhler et al. (2006); Guatemala: Daniel Ariano-Sánchez, personal data.

Country	Sex	V	SC	TE	SL	IL	TOL	SVL	TAL/TOL
CR	M	115–123	23–28	0–2	7–7	6–6	63–157	55–135†	12–14%
	F	120–129	19–24		7–7	6–6		57–138†	10–12%
NIC	M	115–119	25–28	2	7–7	6–6	141–145	122–124	13–14%
	F	116–120	22–27	2	7–7	6–6			14–15%
HN	F	117–128	22–26	2	7–7	6–7	73–156	64–132	12–15%
ES	F	118	19	2	7–7	6–6	77	69	12%
GUA	F	127	24	2	7–7	6–6	167	147	12%

† These data were calculated between the TOL range and the TAL/TOL ratio for each sex.

vulnerability category, based on its almost exclusive occurrence in dry and arid lowland forest, on its semi-fossorial habits, and on the distribution extending from southeastern Guatemala to northwestern Costa Rica (Johnson et al. 2015). This information serves to place *T. vermiformis* in the priority one level in the conservation priority list of endemic species of Central America (Mata-Silva et al. 2019).

McCranie et al. (2014) published eight records of reptiles from the same locality, including the endangered Pit Viper, *Agkistrodon howardgloydi* Conant, 1984, and these authors highlighted the need for more study and monitoring to understand the faunal composition and to devise a management plan to protect the lowland arid forest, because there are only a few relatively extensive patches left. Our new record helps to reinforce this conclusion and, along with *T. vermiformis*, several other snake species also found for the first time in this forest (JRG unpublished data), indicating that the herpetofaunal component might be greater and, therefore, such patches are important reservoirs for the herpetofauna of the lowland arid forest.

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Authors' Contributions

CAAF found the specimen and CAAF, OEJC, JRG collected it. CAAF took the measurements, did the scale counting, drew up the color description, and took the photographic record of the locality. JRG and OEJC photographed the specimen. LDW and JRG identified, JRG preserved the specimen and with CAAF elaborated the map. CAAF, JRG, LDW, and OEJC worked on the writing, comments, and revisions of the document.

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Appendix

Table A1. New and historical localities of the records of *Tantilla vermiformis*.

Site	Country	Department	Locality	Latitude	Longitude	Altitude a.s.l. (m)	Reference
1	Costa Rica	Guanacaste	Finca La Pacifica, NW Cañas	10.4551°N	−085.1318°W	50	Van Devender and Cole 1977; Wilson 1982a; GBIF 2020
2			0.6 km E Los Angeles de Tilarán	10.4925°N	−085.0158°W	480	Van Devender and Cole 1977
3			1.0 km E Los Angeles de Tilarán	10.4894°N	−085.0113°W	500	Van Devender and Cole 1977
4			1.2 km E Los Angeles de Tilarán	10.4913°N	−085.0097°W	510	Van Devender and Cole 1977
5			2.0 km E Los Angeles de Tilarán	10.5008°N	−085.0055°W	520	Van Devender and Cole 1977
6			8.1 km N Estación Experimental Forestal Horizontes †	10.7850°N	−085.5519°W	90	Savage 2002
7	Nicaragua	Nuevo León	Laguna Monte Galán	12.4391°N	−086.5769°W	64	Wilson and Villa 1973; Wilson 1982a; Wilson 1987; GBIF 2020
8		Chinandega	NE Reserva Natural Complejo Volcanico †	12.7544°N	−086.8930°W	26	Köhler 2001; GBIF 2020
9		Managua	7.0 km S Las Piedrescitas	12.0713°N	−086.2936°W	404	Wilson 1982a; Wilson 1987; GBIF 2020
10	Honduras	Valle	Isla Exposición	13.3002°N	−087.6669°W	20	McCranie et al. 2013
11		El Paraíso	El Rodeo	13.8983°N	−086.7727°W	450	This study
12	El Salvador	San Salvador	Lago Ilopango	13.6666°N	−089.0500°W	400	Köhler et al. 2006; GBIF 2020
13			La Libertad †	13.7358°N	−089.2605°W	685	Köhler et al. 2006
14		Sonsonate	San Antonio del Monte †	13.7158°N	−089.7525°W	279	Mentioned by Ariano-Sánchez 2015
15	Guatemala	Zacapa	RNC del Heloderma y Bosque Seco	14.8629°N	−089.7881°W	590	Ariano-Sánchez 2015

†We approximated the geographical coordinates that were too imprecise or not provided.